DATA EXCHANGE [NETL Energy Data eXchange (EDX)]

for Deep, Controlled Source Electro-Magnetic Sensing: A Cost Effective, Long-term Tool for Sequestration Monitoring

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For Award

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Explanation of Data

There are two folders entitled **Trip 3** and **Trip 4**. Data categorized in the **Trip 3** directory were collected between August 27, 2015 and September 1, 2015. Data categorized in the **Trip 4** directory were collected between April 6, 2016 and April 11, 2016. All data were collected along the three lines shown in Figure 1. The red-dashed square shows the electrodes that were repeated for both Line 1 and Line 2. The region shown in Figure 1 is an area located at the Ketzin site in Ketzin, Germany (Ketzin is shown in the lower left hand corner).

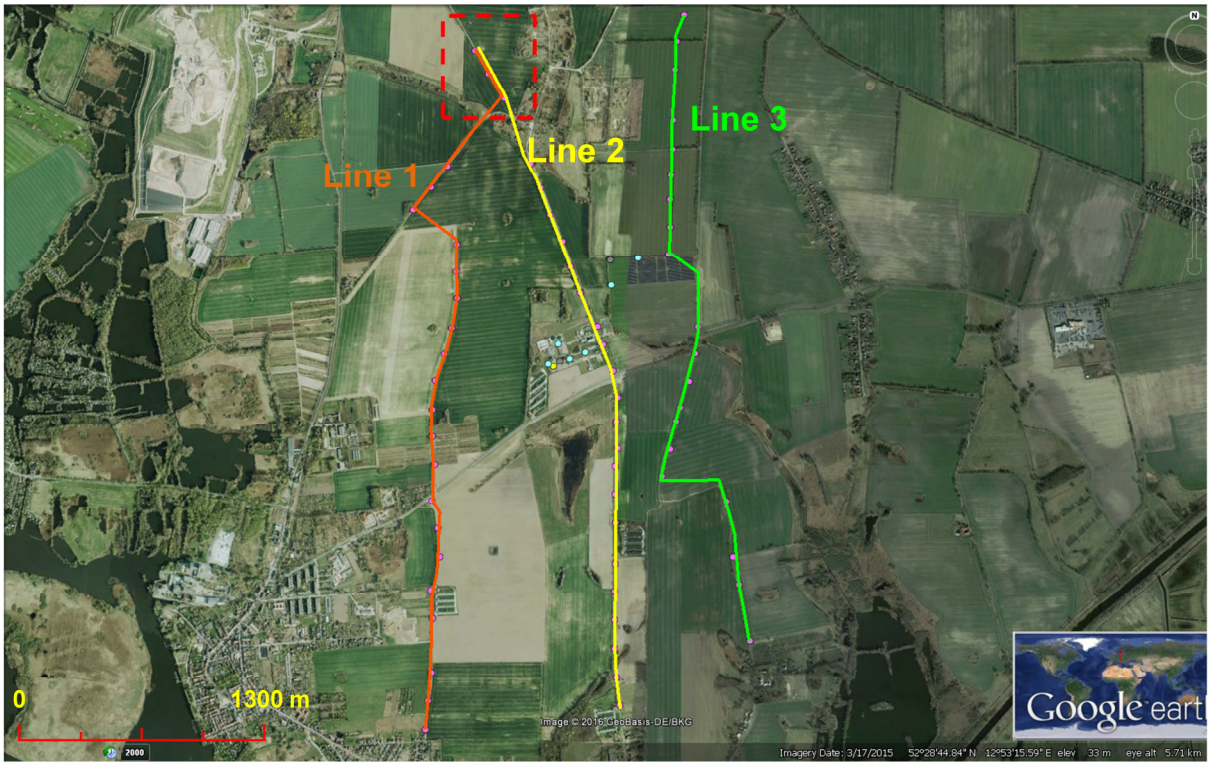

Figure 1. Map showing configurations for the CSEM survey Phase II (Trip 3) and Phase III (Trip 4). Each instrument location would include three electrodes (pink dots).

Data are categorized by array type. The types are **Dual Dipole**, **Linear Mid-range** [-Batch], **Linear 0.125Hz** [p125], **Walsh 4 Mid-range**, and **Walsh 4 0.125Hz** [4_p125].

- **Dual Dipole** data are collected using the multi-source approach, by transmitting current simultaneously on two different dipoles and receiving the current on one dipole. The Dual Dipole data were collected at frequencies ranging from 0.125Hz to 7.5Hz.
- **Linear Mid-range** data are collected using a single transmitting dipole and a single receiving dipole per data point. Data are collected at frequencies ranging from 0.5Hz to 7.5Hz.
- **Linear 0.125** data are collected using a single transmitting dipole and a single receiving dipole per data point, and are collected only at a frequency of 0.125 Hz.

- **Walsh 4 Mid-range** data are collected using the multi-source approach, by transmitting current simultaneously on 4 different dipoles and receiving the current on one dipole. The Walsh 4 data were collected at frequencies ranging from 0.5Hz to 7.5 Hz.
- **Walsh 4 0.125** data are collected using the same multisource approach as the Walsh 4 Mid-range, but are only collected at a frequency of 0.125Hz.

Data have been processed in order to correct the field line and electrode labels to a universal nomenclature. Raw data originally identified electrodes as being electrode 1, 2, or 3, and the line number as the transceiver's radio ID. Processed data line numbers are now 1, 2, 3, or 11. Lines 1, 2, and 3 are surface lines with Line 1 being the west-most line and Line 3 being the east-most line (as shown in Figure 1). Line 11 contains the electrodes in the borehole (Well 201, shown as a yellow dot in the center of the figure) as well as the surface electrode located above the borehole. Note that Line 1 in the electrode table only includes 21 electrodes. This is due to the 3 north-most electrodes of Line 2 being shared in the schedules for both Line 1 and Line 2 (as shown in the red-dashed box in Figure 1). All of the data points, including northing, easting and elevations are shown in Table 2 below.

During data collection the instrument records multiple data stacks. Each stack estimates the value of the data values over two waveforms. The instrument calculates the average data value and an estimated standard deviation of the data using these values from the individual data stacks. To improve overall data quality, each data value was collected several times and averaged in post processing. The averages were weighted by the inverse of the estimated variance.

Data taken at 0.125 Hz have been assigned the DAS style Amplitude and Phase, which allows for these values to be negative.

Table 1. Brief description of data columns.

Column Header	Column Number	Description
Data Point	1	Data point is the ID number assigned to the unique quadrupole used in a given data set.
Line A	2	The Line A value represents the Line ID of the Transmitting electrode "A" in a transmitting dipole.
El A	3	The El A value represents the Electrode ID of the Transmitting electrode "A" in a transmitting dipole.
Line B	4	The Line B value represents the Line ID of the Transmitting electrode "B" in a transmitting dipole.
El B	5	The El B value represents the Electrode ID of the Transmitting electrode "B" in a transmitting dipole.
Line M	6	The Line M value represents the

		Line ID of the Receiving electrode “M” in a receiving dipole.
El M	7	The El M value represents the Electrode ID of the Receiving electrode “M” in a receiving dipole.
Line N	8	The Line N value represents the Line ID of the Receiving electrode “N” in a receiving dipole.
El N	9	The El N value represents the Electrode ID of the Receiving electrode “N” in a receiving dipole.
Amplitude (Volts/Amp)	10	Amplitude of the average received voltage over the average transmitted current.
Corrected Phase (milliradians)	11	Phase of received voltage relative to that of the transmitter.
Corrected Real (Volts/Amp)	12	Real component of received voltage divided by the current flow.
Corrected Imag (Volts/Amp)	13	Imaginary component of received voltage divided by the current flow.
STDev. (Volt/Amp)	14	Estimated standard deviation of the corrected real and imaginary components in columns 12 and 13.
Real Unc. V (Volts)	15	Real component of the received voltage not normalized by the current. Note that the phase reference for both the transmitter’s current is derived from GPS timing.
Imag Unc. V (Volts)	16	Imaginary component of the received voltage not normalized by the current. Note that the phase reference for both the transmitter’s current is derived from GPS timing.
STD. Unc. (Volts)	17	Standard deviation of the uncorrected real and imaginary components found in columns 15 and 16
Real Current (milliamps)	18	Real component of the transmitted current. Note that the phase reference for both the transmitter’s current is derived

		from GPS timing.
Imag Current (milliamps)	19	Imaginary component of the transmitted current. Note that the phase reference for both the transmitter's current is derived from GPS timing. For an ideal transmitter, this value would be zero.
Freq. (Hz)	20	Frequency (in Hertz) at which data point was collected.
Stacks	21	Number of times signal was averaged.

Table 2. Location of the electrodes for Trip 3 and Trip 4.

Line #	Electrode #	Trip 3 Easting	Trip 3 Northing	Trip 3 Elev.	Trip 4 Easting	Trip 4 Northing	Trip 4 Elev.
1	1	354701.492	5818915.923	38.7096	354701.492	5818915.923	38.7096
1	2	354607.0492	5818800.736	38.1	354607.0492	5818800.736	38.1
1	3	354513.1817	5818682.194	37.1856	354513.1817	5818682.194	37.1856
1	4	354736.1567	5818504.161	38.1	354736.1567	5818504.161	38.1
1	5	354735.7459	5818352.792	36.8808	354735.7459	5818352.792	36.8808
1	6	354736.7259	5818202.495	34.7472	354736.7259	5818202.495	34.7472
1	7	354709.941	5818055.246	33.528	354709.941	5818055.246	33.528
1	8	354672.3265	5817909.432	32.9184	354672.3265	5817909.432	32.9184
1	9	354619.2283	5817768.53	32.6136	354619.2283	5817768.53	32.6136
1	10	354587.0075	5817621.444	31.6992	354587.0075	5817621.444	31.6992
1	11	354579.8711	5817472.5	31.0896	354579.8711	5817472.5	31.0896
1	12	354586.28	5817322.042	31.0896	354586.28	5817322.042	31.0896
1	13	354648.079	5817183.298	32.004	354648.079	5817183.298	32.004
1	14	354615.8895	5817037.324	32.004	354615.8895	5817037.324	32.004
1	15	354606.6846	5816887.328	32.9184	354606.6846	5816887.328	32.9184
1	16	354594.7306	5816736.301	34.7472	354594.7306	5816736.301	34.7472
1	17	354565.1877	5816588.023	36.576	354565.1877	5816588.023	36.576
1	18	354560.7018	5816436.774	38.4048	354560.7018	5816436.774	38.4048
1	19	354553.4997	5816285.607	39.0144	354553.4997	5816285.607	39.0144
1	20	354536.7904	5816134.721	39.3192	354536.7904	5816134.721	39.3192
1	21	354518.0762	5815985.008	39.624	354518.0762	5815985.008	39.624
2	1	354861.1113	5819534.528	43.2816	354861.1113	5819534.528	43.2816
2	2	354933.2293	5819401.046	39.9288	354933.2293	5819401.046	39.9288
2	3	355005.3844	5819268.678	39.0144	355005.3844	5819268.678	39.0144
2	4	355109.608	5818957.266	34.7472	355109.608	5818957.266	34.7472
2	5	355180.2205	5818818.268	32.004	355180.2205	5818818.268	32.004
2	6	355229.6982	5818676.556	30.48	355229.6982	5818676.556	30.48
2	7	355298.1622	5818487.534	31.3944	355298.1622	5818487.534	31.3944
2	8	355346.2569	5818344.751	32.6136	355346.2569	5818344.751	32.6136
2	9	355395.7452	5818203.041	32.9184	355395.7452	5818203.041	32.9184
2	10	355451.4115	5818063.376	32.004	355487.1808	5818064.237	32
2	11	355500.1946	5817920.575	32.004	355500.1946	5817920.575	32.004
2	12	355550.3713	5817778.846	31.6992	355550.3713	5817778.846	31.6992
2	13	355576.5942	5817631.146	30.7848	355598.4169	5817663.339	31
2	14	355571.5246	5817482.141	31.3944	355571.5246	5817482.141	31.3944
2	15	355566.3894	5817330.912	31.0896	355566.3894	5817330.912	31.0896
2	16	355564.0028	5817180.716	33.2232	355564.0028	5817180.716	33.2232
2	17	355555.5059	5817030.699	34.1376	355555.5059	5817030.699	34.1376
2	18	355549.0129	5816879.511	34.7472	355549.0129	5816879.511	34.7472

2	19	355547.3056	5816729.294	34.7472	355547.3056	5816729.294	34.7472
2	20	355538.8084	5816579.278	34.1376	355538.8084	5816579.278	34.1376
2	21	355533.0272	5816429.181	31.6992	355533.0272	5816429.181	31.6992
2	22	355527.8922	5816277.953	31.6992	355527.8922	5816277.953	31.6992
2	23	355533.6554	5816127.516	35.3568	355533.6554	5816127.516	35.3568
2	24	355548.2802	5815977.932	36.2712	355548.2802	5815977.932	36.2712
3	1	355960.3086	5819728.042	49.0728	355985.7048	5819711.465	49
3	2	355955.8938	5819577.905	48.1584	355955.8938	5819577.905	48.1584
3	3	355948.7646	5819427.847	43.8912	355948.7646	5819427.847	43.8912
3	4	355922.5436	5819113.614	39.0144	355922.5436	5819113.614	39.0144
3	5	355915.4138	5818963.557	37.1856	355915.4138	5818963.557	37.1856
3	6	355906.9265	5818813.54	35.9664	355906.9265	5818813.54	35.9664
3	7	355904.9481	5818700.063	35.9664	355904.9481	5818700.063	35.9664
3	8	355894.4244	5818550.106	35.9664	355894.4244	5818550.106	35.9664
3	9	355887.2616	5818398.937	35.9664	355887.2616	5818398.937	35.9664
3	10	356035.9719	5818281.031	35.052	356035.9719	5818281.031	35.052
3	11	356027.4888	5818131.014	33.528	356027.4888	5818131.014	33.528
3	12	356026.5051	5817981.889	31.3944	356026.5051	5817981.889	31.3944
3	13	356010.4457	5817897.766	31.3944	356011.5429	5817874.73	32
3	14	355967.5039	5817754.327	32.004	355963.3226	5817730.209	32
3	15	355923.881	5817610.908	32.004	355918.594	5817588.988	32
3	16	355880.2233	5817466.377	33.8328	355896.0456	5817508.952	37
3	17	355830.4857	5817323.139	39.624	355848.8892	5817368.728	41
3	18	355797.588	5817174.953	42.3672	355811.0055	5817222.977	41
3	19	356114.8124	5817171.197	33.8328	356121.5343	5817121.097	33
3	20	356147.8789	5817024.413	32.004	356154.4272	5816974.813	32
3	21	356172.0885	5816876.776	31.0896	356163.6201	5816824.896	30
3	22	356201.0232	5816612.127	30.1752	356201.0232	5816612.127	30.1752
3	23	356223.1676	5816463.438	30.1752	356223.1676	5816463.438	30.1752
3	24	356245.3137	5816314.75	30.7848	356245.3137	5816314.75	30.7848
11	1	355272.1178	5817844.958	34	355272.1178	5817844.958	34
11	2	355242.6668	5817804.62	-562.48	355242.6668	5817804.62	-562.48
11	3	355242.6668	5817804.62	-572.47	355242.6668	5817804.62	-572.47
11	4	355242.6668	5817804.62	-582.46	355242.6668	5817804.62	-582.46
11	5	355242.6668	5817804.62	-592.44	355242.6668	5817804.62	-592.44
11	6	355242.6668	5817804.62	-602.63	355242.6668	5817804.62	-602.63
11	7	355242.6668	5817804.62	-610.1	355242.6668	5817804.62	-610.1
11	8	355242.6668	5817804.62	-621.35	355242.6668	5817804.62	-621.35
11	9	355242.6668	5817804.62	-629.5	355242.6668	5817804.62	-629.5
11	10	355242.6668	5817804.62	-639.51	355242.6668	5817804.62	-639.51
11	11	355242.6668	5817804.62	-649.51	355242.6668	5817804.62	-649.51

11	12	355242.6668	5817804.62	-659.5	355242.6668	5817804.62	-659.5
11	13	355242.6668	5817804.62	-669.5	355242.6668	5817804.62	-669.5
11	14	355242.6668	5817804.62	-679.48	355242.6668	5817804.62	-679.48
11	15	355242.6668	5817804.62	-689.47	355242.6668	5817804.62	-689.47
11	16	355242.6668	5817804.62	-699.69	355242.6668	5817804.62	-699.69